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6. AUTHOR(S) I-Wei Chen					
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13. ABSTRACT (Maximum 200 words) Major requisitions include a four-target RF sputtering system from Denton Vacuum Industry and a scanning probe microscope system from AutoProbe Inc. Using these instruments, oxide thin films of various compositions and heterostructures have been prepared to investigate the phenomenon of fatigue. It was found that the rate of degradation is sensitive to the type of charge carriers. Electrons accelerate fatigue while holes do not. It was also found that fatigue has a strong frequency dependence. This is best characterized by monitoring the increase of coercive field as a function of frequency after fatigue. The latter phenomenon has been modelled using interface dynamics involving bow-out and defect trapping.					
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***I. TITLE OF PROJECT***

***DURIP PROPOSAL FOR AN ION-ASSISTED SPUTTERING DEPOSITION  
SYSTEM FOR NANO-MODULATED OXIDE COATINGS***

***FINAL TECHNICAL REPORT***

***AUGUST 1, 1995 - JULY 31, 1997***

***U.S. AIR FORCE GRANT NO. F49620-95-1-0472***

**PRINCIPAL INVESTIGATOR:**

**I-WEI CHEN**

**DEPARTMENT OF MATERIALS SCIENCE & ENGINEERING  
UNIVERSITY OF MICHIGAN, ANN ARBOR, MICHIGAN**

Funds of \$270,000 were received for the acquisition of a sputtering system for preparation of thin films and surface studies of the structure and properties of nano-modulated oxides. A cost sharing of \$130,000 from the University of Michigan has also been expended to supplement the received grant. Major requisitions include a four-target RF sputtering system from Denton Vacuum Industry (\$270,000), a scanning probe microscope system from AutoProbe Inc. (\$174,214), a spin coater thin film system from Brewer Inc. (\$6,000), a recirculating water chiller for the sputtering system from Haskris Inc. (\$7,000), and a digital oscilloscope from Hewlett Packard Inc (\$12,000). Other equipment components purchased separately (not from the original equipment manufacturers in order to save pass-on costs) included various sputtering targets and meters that went with the sputtering chamber. Since the total amount of the above purchases exceeded the original budget, additional funding from the Department of Materials Science and Engineering at the University of Michigan was sought and provided.

Oxide thin films of various compositions and heterostructures have been prepared to investigate the phenomenon of fatigue. It was found that the rate of degradation is sensitive to the type of charge carriers. Electrons accelerate fatigue while holes do not. It was also found that fatigue has a strong frequency dependence. This is best characterized by monitoring the increase of coercive field as a function of frequency after fatigue. The latter phenomenon has been modeled using interface dynamics involving bow-out and defect trapping.

The transfer of PI, Professor I-Wei Chen from the University of Michigan to the University of Pennsylvania in the summer of 1997 motivated the request of equipment transfer. The sputtering system, spin coater, and the water chiller have since been transferred to the University of Pennsylvania, Department of Materials Science and Engineering and is currently in use for Professor Chen's research. The scanning probe microscope remains in the University of Michigan and is currently in use by Professor Rachel Goldman in the Department of Materials Science and Engineering. The digital oscilloscope also remains in the same department and is being used by Professor Albert Yee.